## CLAIMS

What is claimed is:

1. A measurement system for determining the tilt of a reflective object mounted to a support, the system comprising:

first, second, third and fourth sensors, each capable of generating data indicative of a distance between the first, second, third or fourth sensor, respectively, and a reflective surface of the reflective object; and

a controller for receiving inputs from the first, second, third and fourth sensors and determining a tilt of the reflective surface with respect to a z axis;

wherein:

the support has a generally planar surface that is generally perpendicular to the z axis but which may tilt with respect thereto,

the reflective object is mounted to the support so that the reflective surface is in a plane substantially parallel with the z axis and longitudinally extends substantially parallel to an axis normal to the z axis;

the first and second sensors are aligned substantially parallel to the axis normal to the z axis along which the reflective surface extends longitudinally and are separated by a distance a;

the third and fourth sensors are aligned substantially parallel to the axis normal to the z axis along which the reflective surface extends longitudinally and are separated by the distance a;

the first and third sensors are aligned substantially parallel to the z axis and are separated by a distance b;

the second and fourth sensors are aligned substantially parallel to the z axis and are separated by the distance b; and

the controller determines a tilt of the reflective surface at a location ka along the longitudinally extending direction of the reflective surface according to the following formula:

$$\Delta(ka) = \Phi((k+1)a) - \Phi(ka)$$

where:

$\Delta(ka)$ is a measure of a displacement of the reflective surface out of the plane substantially parallel with the z axis, at location ka;

$\Phi(ka)$ is a measure of tilt of the reflective surface measured by the second and fourth sensors; and

$\Phi((k+1)a)$ is a measure of tilt of the reflective surface measured by the first and third sensors.

2. The measurement system of claim 1, wherein the third and fourth sensors are aligned substantially parallel to the axis normal to the z axis along which the reflective surface extends longitudinally and are separated by a distance c.

3. The measurement system of claim 1, wherein:

$\theta(x)$ is a measure of tilt of the support;

s(x) is a measure of displacement, out of the plane substantially parallel with the z axis, of the reflective surface when $z = 0$;

t(x) is a measure of displacement, out of the plane substantially parallel with the z axis, of the reflective surface when $z = -b$;

$\delta(x)$ is a measure of displacement of the support along the x axis normal to the z axis;

a measurement value for the second sensor when the reflective surface is at a position $y = ka$ is determined by $L2(ka) = s(ka) + \delta(ka) - (b/2)\theta(ka)$;

a measurement value for the fourth sensor when the reflective surface is at a position $y = ka$ is determined by $L4(ka) = t(ka) + \delta(ka) + (b/2)\theta(ka)$;

a measurement value for the first sensor when the reflective surface is at a position $y = ka$ is determined by $L1(ka) = s(ka+a) + \delta(ka) - (b/2)\theta(ka)$;

a measurement value for the third sensor when the reflective surface is at a position y = ka is determined by $L3(ka) = t(ka+a) + \delta(ka) + (b/2)\theta(ka)$;

$\Delta(ka) = J2(ka) - J1(ka) = \Phi((k+1)a) - \Phi(ka)$, where $J1(ka) \equiv (L4(ka)-L2(ka))/b = (t(ka)-s(ka))/b+\theta(ka) = \Phi(ka)+\theta(ka)$, and $J2(ka) \equiv (L3(ka)-L1(ka))/b = (t((k+1)a)-s((k+1)a))/b+\theta(ka) = \Phi((k+1)a)+\theta(ka)$;

the reflective surface can be moved to a position y = ka + a along the y axis normal to the z axis along which the reflective surface extends longitudinally;

a measurement value for the second sensor when the reflective surface is at a position y = ka + a is determined by $L2(ka+a) = s(ka+a) + \delta(ka+a) - (b/2)\theta(ka+a)$;

a measurement value for the fourth sensor when the reflective surface is at a position y = ka + a is determined by $L4(ka+a) = t(ka+a) + \delta(ka+a) + (b/2)\theta(ka+a)$;

a measurement value for the first sensor when the reflective surface is at a position y = ka + a is determined by $L1(ka+a) = s(ka+a+a) + \delta(ka+a) - (b/2)\theta(ka+a)$;

a measurement value for the third sensor when the reflective surface is at a position y = ka + a is determined by $L3(ka+a) = t(ka+a+a) + \delta(ka+a) + (b/2)\theta(ka+a)$;

$\Delta((k+1)a) = J2((k+1)a) - J1((k+1)a) = \Phi((k+2)a) - \Phi((k+1)a)$, where $J1((k+1)a) \equiv (L4((k+1)a)-L2((k+1)a))/b = (t((k+1)a)-s((k+1)a))/b+\theta((k+1)a) = \Phi((k+1)a)+\theta((k+1)a)$, and $J2((k+1)a) \equiv (L3((k+1)a)-L1((k+1)a))/b = (t((k+2)a)-s((k+2)a))/b+\theta((k+1)a) = \Phi((k+2)a)+\theta((k+1)a)$;

the reflective surface can be incrementally moved to additional positions in multiples of a along the axis normal to the z axis along which the reflective surface extends longitudinally and additional measurement values for the sensors can be determined to arrive at a set of measurement values $\{\Delta((k-1)a) = \Phi(ka) - \Phi((k-1)a); \Delta((k-2)a) = \Phi((k-1)a) - \Phi((k-2)a); \ldots; \Delta(0) = \Phi(a) - \Phi(0)\}$; and

the controller determines a summation of the set of measurement values as $\sum_{m=0}^{k-1}\Delta(ma)=\Phi(ka)-\Phi(0)$ and a tilt of the reflective surface at a location ka along the longitudinally extending direction of the reflective surface as $\Phi(ka)=\Phi(0)+\sum_{m=0}^{k-1}\Delta(ma)$.

4. The measurement system of claim 1, wherein the first, second third and fourth sensors comprise first, second, third and fourth laser beams.

5. The measurement system of claim 4, wherein the first second, third and fourth laser beams are incorporated into an interferometer system.

6. The measurement system of claim 1, wherein the reflective surface comprises a first reflective surface; the measurement system further comprising:

fifth, sixth, seventh and eighth sensors, each capable of generating data indicative of a distance between the fifth, sixth, seventh or eighth sensor, respectively, and a second surface that corresponds to a reflective surface of a second reflective object;

wherein the controller receives inputs from the fifth, sixth, seventh and eighth sensors and determines a tilt of the second reflective surface with respect to the z axis, wherein the second reflective object is mounted to the support so that the second reflective surface is in a second plane substantially parallel with the z axis and longitudinally extends substantially parallel to an axis normal to the z axis and normal to the axis which the first reflective surface extends substantially parallel to;

wherein the fifth and sixth sensors are aligned substantially parallel to the axis normal to the z axis along which the second reflective surface extends longitudinally and are separated by a distance a;

wherein the seventh and eighth sensors are aligned substantially parallel to the axis normal to the z axis along which the second reflective surface extends longitudinally and are separated by the distance a;

wherein the fifth and seventh sensors are aligned substantially parallel to the z axis and are separated by the distance b;

wherein the sixth and eighth sensors are aligned substantially parallel to the z axis and are separated by the distance b;

and wherein the controller determines a tilt of the second reflective surface at a location ka along the longitudinally extending direction of the second reflective surface according to the following formula:

$$\Delta(ka) = \Phi((k+1)a)-\Phi(ka)$$

where:

$\Delta(ka)$ is a measure of a displacement of the second reflective surface out of the second plane substantially parallel with the z axis, at location ka;

$\Phi(ka)$ is a measure of tilt of the second reflective surface measured by the sixth and eighth sensors; and

$\Phi((k+1)a)$ is a measure of tilt of the reflective surface measured by the fifth and seventh sensors.

7. The measurement system of claim 6, wherein:

$\theta(y)$ is a measure of tilt of the support;

$s(y)$ is a measure of displacement, out of the plane substantially parallel with the z axis, of the second reflective surface when $z = 0$;

$t(y)$ is a measure of displacement, out of the plane substantially parallel with the z axis, of the second reflective surface when $z = -b$;

$\delta(y)$ is a measure of displacement of the support along the y axis normal to the z axis;

a measurement value for the sixth sensor when the second reflective surface is at a position $x = ka$ is determined by $L6(ka) = s(ka) + \delta(ka) - (a/2)\theta(ka)$;

a measurement value for the eighth sensor when the second reflective surface is at a position $x = ka$ is determined by $L8(ka) = t(ka) + \delta(ka) + (a/2)\theta(ka)$;

a measurement value for the fifth sensor when the second reflective surface is at a position $x = ka$ is determined by $L5(ka) = s(ka+a) + \delta(ka) - (a/2)\theta(ka)$;

a measurement value for the seventh sensor when the second reflective surface is at a position $x = ka$ is determined by $L7(ka) = t(ka+a) + \delta(ka) + (a/2)\theta(ka)$;

$\Delta(ka) = J2(ka)- J1(ka) = \Phi((k+1)a)-\Phi(ka)$, where $J1(ka) \equiv (L8(ka)-L6(ka))/b = (t(ka)-s(ka))/b+\theta(ka) = \Phi(ka)+\theta(ka)$, and $J2(ka) \equiv(L7(ka)-L5(ka))/b = (t((k+1)a)-s((k+1)a))/b+\theta(ka) = \Phi((k+1)a)+\theta(ka)$;

the second reflective surface can be moved to a position x = ka + a along the axis normal to the z axis along which the second reflective surface extends longitudinally;

a measurement value for the sixth sensor when the second reflective surface is at a position x = ka + a is determined by L6(ka+a) = s(ka+a) + $\delta$(ka+a) - (a/2)$\theta$(ka+a);

a measurement value for the eighth sensor when the second reflective surface is at a position x = ka + a is determined by L8(ka+a) = t(ka+a) + $\delta$(ka+a) + (a/2)$\theta$(ka+a);

a measurement value for the fifth sensor when the second reflective surface is at a position x = ka + a is determined by L5(ka+a) = s(ka+a+a) + $\delta$(ka+a) - (a/2)$\theta$(ka+a);

a measurement value for the seventh sensor when the second reflective surface is at a position x = ka + a is determined by L7(ka+a) = t(ka+a+a) + $\delta$(ka+a) + (a/2)$\theta$(ka+a);

$\Delta$((k+1)a) = J2((k+1)a)- J1((k+1)a) = $\Phi$((k+2)a)-$\Phi$((k+1)a), where J1((k+1)a) ≡ (L8((k+1)a)-L6((k+1)a))/b = (t((k+1)a)-s((k+1)a))/b+$\theta$((k+1)a) = $\Phi$((k+1)a)+$\theta$((k+1)a), and J2((k+1)a) ≡(L7((k+1)a)-L5((k+1)a))/b = (t((k+2)a)-s((k+2)a))/b+$\theta$((k+1)a) = $\Phi$((k+2)a)+$\theta$((k+1)a);

the second reflective surface can be incrementally moved to additional positions in multiples of a along the axis normal to the z axis along which the second reflective surface extends longitudinally and additional measurement values for the sensors can be determined to arrive at a set of measurement values {$\Delta$((k-1)a) = $\Phi$(ka) - $\Phi$((k-1)a); $\Delta$((k-2)a) = $\Phi$((k-1)a) - $\Phi$((k-2)a); ...; $\Delta$(0) = $\Phi$(a) - $\Phi$(0)}; and

the controller determines a summation of the set of measurement values as $\sum_{m=0}^{k-1}\Delta(ma)=\Phi(ka)-\Phi(0)$ and a tilt of the second reflective surface at a location ka along the longitudinally extending direction of the second reflective surface as

$$\Phi(ka)=\Phi(0)+\sum_{m=0}^{k-1}\Delta(ma).$$

8. The measurement system of claim 6, wherein said first, second third and fourth sensors comprise first, second, third and fourth laser beams; and wherein said fifth, sixth, seventh and eighth sensors comprise fifth, sixth, seventh and eighth laser beams.

9. The measurement system of claim 8, wherein said first second, third and fourth laser beams are incorporated into a first interferometer system, and wherein said fifth, sixth, seventh and eighth laser beams are incorporated into a second interferometer system.

10. The measurement system of claim 1, further comprising at least one motor operatively mounted to said support to move said support, said reflective surface and said reflective object in the directions along which said reflective surface longitudinally extends, wherein said motor incrementally moves said reflective surface to measure displacement of said reflective surface out of said plane substantially parallel with the z axis at each incremental location.



11. The measurement system of claim 10, wherein said tilt of said reflective surface, at a position ka is defined by:

$$\Phi(ka)=\Phi(0)+\sum_{m=0}^{k-1}\Delta(ma)$$

where:

$\Phi$(ka) is a measure of tilt of said reflective surface at position ka;

$\Phi$(0) is a measure of tilt of said reflective surface at an initial measurement location near one end of said reflective surface: and

$\Delta$(ma) is a measure of displacement of said reflective surface out of said plane substantially parallel with the z axis, at locations where m = 0, 1, 2, ...k-1.

12. A interferometric measurement system for determining the tilt of a reflective object mounted to a support, said system comprising:

an interferometer system having first, second, third and fourth laser beam generators, each capable of generating a laser beam to measure a distance between said

first, second, third or fourth generator, respectively, and a reflective surface mounted to a support; and

a controller for receiving inputs from said interferometer system and determining a tilt of said reflective surface with respect to a z axis, wherein the support has a generally planar surface that is generally perpendicular to the z axis but which may tilt with respect thereto, and wherein the reflective surface is in a plane substantially parallel with the z axis and longitudinally extends substantially parallel to an axis normal to the z axis;

and wherein said controller determines a tilt of said reflective surface at a location ka along the longitudinally extending direction of said reflective surface according to the following formula:

$$\Delta(ka) = \Phi((k+1)a)-\Phi(ka)$$

where:

$\Delta(ka)$ is a measure of a displacement of said reflective surface out of said plane substantially parallel with the z axis, at location ka;

$\Phi(ka)$ is a measure of tilt of said reflective surface measured by said second and fourth laser beams; and

$\Phi((k+1)a)$ is a measure of tilt of said reflective surface measured by said first and third laser beams.

13. The interferometric measurement system of claim 12, wherein:

$\theta(x)$ is a measure of tilt of the support;

s(x) is a measure of displacement, out of the plane substantially parallel with the z axis, of the reflective surface when z = 0;

t(x) is a measure of displacement, out of the plane substantially parallel with the z axis, of the reflective surface when z = -b;

$\delta(x)$ is a measure of displacement of the support along the axis normal to the z axis;

a measurement value for the second laser beam when the reflective surface is at a position $y = ka$ is determined by $L2(ka) = s(ka) + \delta(ka) - (a/2)\theta(ka)$;

a measurement value for the fourth laser beam when the reflective surface is at a position $y = ka$ is determined by $L4(ka) = t(ka) + \delta(ka) + (a/2)\theta(ka)$;

a measurement value for the first laser beam when the reflective surface is at a position $y = ka$ is determined by $L1(ka) = s(ka+a) + \delta(ka) - (a/2)\theta(ka)$;

a measurement value for the third laser beam when the reflective surface is at a position $y = ka$ is determined by $L3(ka) = t(ka+a) + \delta(ka) + (a/2)\theta(ka)$;

$\Delta(ka) = J2(ka) - J1(ka) = \Phi((k+1)a) - \Phi(ka)$, where $J1(ka) \equiv (L4(ka)-L2(ka))/b = (t(ka)-s(ka))/b+\theta(ka) = \Phi(ka)+\theta(ka)$, and $J2(ka) \equiv (L3(ka)-L1(ka))/b = (t((k+1)a)-s((k+1)a))/b+\theta(ka) = \Phi((k+1)a)+\theta(ka)$;

the reflective surface can be moved to a position $y = ka + a$ along the axis normal to the z axis along which the reflective surface extends longitudinally;

a measurement value for the second laser beam when the reflective surface is at a position $y = ka + a$ is determined by $L2(ka+a) = s(ka+a) + \delta(ka+a) - (a/2)\theta(ka+a)$;

a measurement value for the fourth laser beam when the reflective surface is at a position $y = ka + a$ is determined by $L4(ka+a) = t(ka+a) + \delta(ka+a) + (a/2)\theta(ka+a)$;

a measurement value for the first laser beam when the reflective surface is at a position $y = ka + a$ is determined by $L1(ka+a) = s(ka+a+a) + \delta(ka+a) - (a/2)\theta(ka+a)$;

a measurement value for the third laser beam when the reflective surface is at a position $y = ka + a$ is determined by $L3(ka+a) = t(ka+a+a) + \delta(ka+a) + (a/2)\theta(ka+a)$;

$\Delta((k+1)a) = J2((k+1)a) - J1((k+1)a) = \Phi((k+2)a) - \Phi((k+1)a)$, where $J1((k+1)a) \equiv (L4((k+1)a)-L2((k+1)a))/b = (t((k+1)a)-s((k+1)a))/b+\theta((k+1)a) = \Phi((k+1)a)+\theta((k+1)a)$, and $J2((k+1)a) \equiv (L3((k+1)a)-L1((k+1)a))/b = (t((k+2)a)-s((k+2)a))/b+\theta((k+1)a) = \Phi((k+2)a)+\theta((k+1)a)$;

the reflective surface can be incrementally moved to additional positions in multiples of a along the axis normal to the z axis along which the reflective surface extends longitudinally and additional measurement values for the laser beams can be determined to arrive at a set of measurement values $\{\Delta((k-1)a) = \Phi(ka) - \Phi((k-1)a); \Delta((k-2)a) = \Phi((k-1)a) - \Phi((k-2)a); \ldots; \Delta(0) = \Phi(a) - \Phi(0)\}$; and

the controller determines a summation of the set of measurement values as $\sum_{m=0}^{k-1}\Delta(ma)=\Phi(ka)-\Phi(0)$ and a tilt of the reflective surface at a location ka along the longitudinally extending direction of the reflective surface as $\Phi(ka)=\Phi(0)+\sum_{m=0}^{k-1}\Delta(ma)$.

14. The interferometric measurement system of claim 12, further comprising at least one motor operatively mounted to said support to move said support and said reflective surface in directions along which said reflective surface longitudinally extends, wherein said motor incrementally moves said reflective surface to measure displacement of said reflective surface out of said plane substantially parallel with the z axis at each incremental location.

15. The interferometric measurement system of claim 14, wherein said tilt of said reflective surface, at a position ka is defined by:

$$\Phi(ka)=\Phi(0)+\sum_{m=0}^{k-1}\Delta(ma)$$

where:

$\Phi$(ka) is a measure of tilt of said reflective surface at position ka;

$\Phi$(0) is a measure of tilt of said reflective surface at an initial measurement location near one end of said reflective surface; and

$\Delta$(ma) is a measure of displacement of said reflective surface out of said plane substantially parallel with the z axis, at locations where m = 0, 1, 2, ...k-1; and a = the distance between any of the first and second laser beams, the third and fourth laser beams, the second and fourth laser beams, and the first and third laser beams.

16. The interferometric measurement system of claim 14, wherein said reflective surface comprises a first reflective surface; said interferometric measurement system further comprising:

a second interferometer system having fifth, sixth, seventh and eighth laser beam generators, each capable of generating a laser beam to measure a distance between said fifth, sixth, seventh or eighth generator, respectively, and a second reflective surface of a second reflective object mounted to the support, said reflective surface comprising a second reflective surface;

wherein said controller receives inputs from said second interferometer system and determines a tilt of the second reflective surface with respect to the z axis, wherein the second reflective object is mounted to the support so that said second reflective surface is in a second plane substantially parallel with the z axis and longitudinally extends substantially parallel to an axis normal to the z axis and normal to the axis which said first reflective surface extends substantially parallel to;

and wherein said controller determines a tilt of said second reflective surface at a location ka along the longitudinally extending direction of said second reflective surface according to the following formula:

$$\Delta(ka) = \Phi((k+1)a)-\Phi(ka)$$

where:

$\Delta(ka)$ is a measure of a displacement of said second reflective surface out of said second plane substantially parallel with the z axis, at location ka;

$\Phi(ka)$ is a measure of tilt of said second reflective surface measured by said sixth and eighth laser beams; and

$\Phi((k+1)a)$ is a measure of tilt of said second reflective surface measured by said fifth and seventh laser beams.

17. The measurement system of claim 16, wherein:

$\theta(y)$ is a measure of tilt of the support;

$s(y)$ is a measure of displacement, out of the plane substantially parallel with the z axis, of the second reflective surface when $z = 0$;

$t(y)$ is a measure of displacement, out of the plane substantially parallel with the z axis, of the second reflective surface when $z = -b$;

$\delta(y)$ is a measure of displacement of the support along the axis normal to the z axis;

a measurement value for the sixth laser beam when the second reflective surface is at a position $x = ka$ is determined by $L6(ka) = s(ka) + \delta(ka) - (a/2)\theta(ka)$;

a measurement value for the eighth laser beam when the second reflective surface is at a position $x = ka$ is determined by $L8(ka) = t(ka) + \delta(ka) + (a/2)\theta(ka)$;

a measurement value for the fifth laser beam when the second reflective surface is at a position $x = ka$ is determined by $L5(ka) = s(ka+a) + \delta(ka) - (a/2)\theta(ka)$;

a measurement value for the seventh laser beam when the second reflective surface is at a position $x = ka$ is determined by $L7(ka) = t(ka+a) + \delta(ka) + (a/2)\theta(ka)$;

$\Delta(ka) = J2(ka) - J1(ka) = \Phi((k+1)a) - \Phi(ka)$, where $J1(ka) \equiv (L8(ka)-L6(ka))/b = (t(ka)-s(ka))/b+\theta(ka) = \Phi(ka)+\theta(ka)$, and $J2(ka) \equiv (L7(ka)-L5(ka))/b = (t((k+1)a)-s((k+1)a))/b+\theta(ka) = \Phi((k+1)a)+\theta(ka)$;

the second reflective surface can be moved to a position $y = ka + a$ along the axis normal to the z axis along which the second reflective surface extends longitudinally;

a measurement value for the sixth sensor when the second reflective surface is at a position $x = ka + a$ is determined by $L6(ka+a) = s(ka+a) + \delta(ka+a) - (a/2)\theta(ka+a)$;

a measurement value for the eighth sensor when the second reflective surface is at a position $x = ka + a$ is determined by $L8(ka+a) = t(ka+a) + \delta(ka+a) + (a/2)\theta(ka+a)$;

a measurement value for the fifth sensor when the second reflective surface is at a position $x = ka + a$ is determined by $L5(ka+a) = s(ka+a+a) + \delta(ka+a) - (a/2)\theta(ka+a)$;

a measurement value for the seventh sensor when the second reflective surface is at a position $x = ka + a$ is determined by $L7(ka+a) = t(ka+a+a) + \delta(ka+a) + (a/2)\theta(ka+a)$;

$\Delta((k+1)a) = J2((k+1)a) - J1((k+1)a) = \Phi((k+2)a) - \Phi((k+1)a)$, where $J1((k+1)a) \equiv (L8((k+1)a)-L6((k+1)a))/b = (t((k+1)a)-s((k+1)a))/b+\theta((k+1)a) = \Phi((k+1)a)+\theta((k+1)a)$, and $J2((k+1)a) \equiv (L7((k+1)a)-L5((k+1)a))/b = (t((k+2)a)-s((k+2)a))/b+\theta((k+1)a) = \Phi((k+2)a)+\theta((k+1)a)$;

the second reflective surface can be incrementally moved to additional positions in multiples of a along the axis normal to the z axis along which the second reflective surface extends longitudinally and additional measurement values for the sensors can be determined to arrive at a set of measurement values $\{\Delta((k-1)a) = \Phi(ka) - \Phi((k-1)a); \Delta((k-2)a) = \Phi((k-1)a) - \Phi((k-2)a); \ldots; \Delta(0) = \Phi(a) - \Phi(0)\}$; and

the controller determines a summation of the set of measurement values as $\sum_{m=0}^{k-1}\Delta(ma)=\Phi(ka)-\Phi(0)$ and a tilt of the second reflective surface at a location ka along the longitudinally extending direction of the second reflective surface as

$$\Phi(ka)=\Phi(0)+\sum_{m=0}^{k-1}\Delta(ma).$$

18. The interferometric measurement system of claim 16, further comprising at least one second motor operatively mounted to said support to move said support and said second reflective surface in directions along which said second reflective surface longitudinally extends, wherein said at least one second motor incrementally moves said second reflective surface to measure displacement of said second reflective surface out of said second plane substantially parallel with the z axis at each incremental location.

19. The interferometric measurement system of claim 18, wherein said tilt of said second reflective surface, at a position ka is defined by:

$$\Phi(ka)=\Phi(0)+\sum_{m=0}^{k-1}\Delta(ma)$$

where:

$\Phi(ka)$ is a measure of tilt of said second reflective surface at position ka;

$\Phi(0)$ is a measure of tilt of said second reflective surface at an initial measurement location near one end of said second reflective surface; and

$\Delta(ma)$ is a measure of displacement of said second reflective surface out of said second plane substantially parallel with the z axis, at locations where $m = 0, 1, 2, \ldots k-1$; and $a$ = the distance between any of the fifth and sixth laser beams, the seventh and eighth laser beams.

20. A method of measuring the tilt of a substantially planar surface with respect to a vertical axis, comprising:

providing a measurement system having the capability of measuring distances between first, second, third and fourth adjacent locations on the substantially planar surface and respective first, second, third and fourth adjacent locations on the measurement system, where the distances measured are along imaginary lines substantially perpendicular to the substantially planar surface;

positioning the substantially planar surfaces such that the measurement system is near an end of the substantially planar surface;

measuring distances between the pairs of first, second, third and fourth locations;

subtracting the distance between the second locations from the distance between the fourth locations and dividing the difference by a distance between the second and fourth locations on the substantially planar surface to give a term J1;

subtracting the distance between the first locations from the distance between the third locations and dividing the difference by the distance between the first and third locations on the substantially planar surface to give a term J2; and

determining a tilt of the substantially planar surface at the location of the substantially planar surface according to the following formula:

$$\Delta(ka) = J2(ka) - J1(ka) = \Phi((k+1)a)-\Phi(ka)$$

where:

$\Delta(ka)$ is a measure of a displacement out of the substantially planar surface;

$\Phi(ka)$ is a measure of tilt of the substantially planar surface with respect to the vertical axis measured between the second and fourth locations;

$\Phi((k+1)a)$ is a measure of tilt of the substantially planar surface with respect to the vertical axis measured between the first and third locations; and

a is a distance between the first and second locations on the substantially planar surface.

21. The method of claim 20, further comprising:

incrementally moving the substantially planar surface in a direction parallel to an axis normal to the vertical axis and away from the end of the surface by the distance a;

measuring distances between the first, second, third and fourth locations on the measurement system and the respective four new locations on the substantially planar surface;

subtracting the distance between the second locations from the distance between the fourth locations and dividing the difference by a distance between the second and fourth locations on the substantially planar surface to give a term J1;

subtracting the distance between the first locations from the distance between the third locations and dividing the difference by the distance between the first and third locations on the substantially planar surface to give a term J2; and

determining a tilt of the substantially planar surface at the new location incrementally removed from a previously measured location according to the following formula:

$$\Delta(ka+a) = J2(ka+a) - J1(ka+a) = \Phi((k+2)a)-\Phi((k+1)a)$$

where:

$\Delta(ka+a)$ is a measure of a displacement out of the substantially planar surface;

$\Phi((k+1)a)$ is a measure of tilt of the substantially planar surface with respect to the vertical axis measured between the second and fourth locations on the measurement system and the new locations on the substantially planar surface; and

$\Phi((k+2)a)$ is a measure of tilt of the substantially planar surface with respect to the vertical axis measured between the first and third locations on the measurement system and the new locations on the substantially planar surface.

22. The method of claim 21, further comprising incrementally repeating the method of claim 20 until an opposite end of the substantially planar surface is reached and no further incremental measurements can be taken, or until a predetermined length of the substantially planar surface has been measured.

23. The method of claim 22, further comprising determining a tilt of the substantially planar surface with respect to the vertical axis for any predetermined position ka according to the following formula:

$$\Phi(ka)=\Phi(0)+\sum_{m=0}^{k-1}\Delta(ma)$$

where:

$\Phi(ka)$ is a measure of tilt of the substantially planar surface with respect to the vertical axis at position ka;

$\Phi(0)$ is a measure of tilt of the substantially planar surface near the end of the substantially planar surface where an initial measurement was taken in claim 19; and

$\Delta(ma)$ is a measure of displacement out of said substantially planar surface, at locations where m = 0, 1, 2, ...k-1.

24. A measurement system for determining the tilt of a reflective object mounted to a support, the system comprising:

first, second, third and fourth sensors, each capable of generating data indicative of a distance between the first, second, third or fourth sensor, respectively, and a reflective surface of the reflective object; and

a controller for receiving inputs from the first, second, third and fourth sensors and determining a tilt of the reflective surface with respect to a z axis;

wherein:

the support has a generally planar surface that is generally perpendicular to the z axis but which may tilt with respect thereto,

the reflective object is mounted to the support so that the reflective surface is in a plane substantially parallel with the z axis and longitudinally extends substantially parallel to an axis normal to the z axis;

the first and second sensors are aligned substantially parallel to the axis normal to the z axis along which the reflective surface extends longitudinally and are separated by a distance a;

the third and fourth sensors are aligned substantially parallel to the axis normal to the z axis along which the reflective surface extends longitudinally and are separated by the distance a;

the first and third sensors are aligned substantially parallel to the z axis and are separated by a distance b;

the second and fourth sensors are aligned substantially parallel to the z axis and are separated by the distance b; and

the controller determines a tilt of the reflective surface along the longitudinally extending direction of the reflective surface.

25. A method of measuring the tilt of a substantially planar surface with respect to a vertical axis, comprising:

providing a measurement system having the capability of measuring distances between first, second, third and fourth adjacent locations on the substantially planar surface and respective first, second, third and fourth adjacent locations on the measurement system, where the distances measured are along imaginary lines substantially perpendicular to the substantially planar surface;

positioning the substantially planar surfaces such that the measurement system is near an end of the substantially planar surface;

measuring distances between the pairs of first, second, third and fourth locations;

subtracting the distance between the second locations from the distance between the fourth locations and dividing the difference by a distance between the second and fourth locations on the substantially planar surface to give a term J1;

subtracting the distance between the first locations from the distance between the third locations and dividing the difference by the distance between the first and third locations on the substantially planar surface to give a term J2; and

determining a tilt of the substantially planar surface at the location of the substantially planar surface.